

sPhenix Toy Simulation

[www.hephy.at/project/ilc/ictoy/
UserGuide_20.pdf](http://www.hephy.at/project/ilc/ictoy/UserGuide_20.pdf)



TPC Detector Parameterization

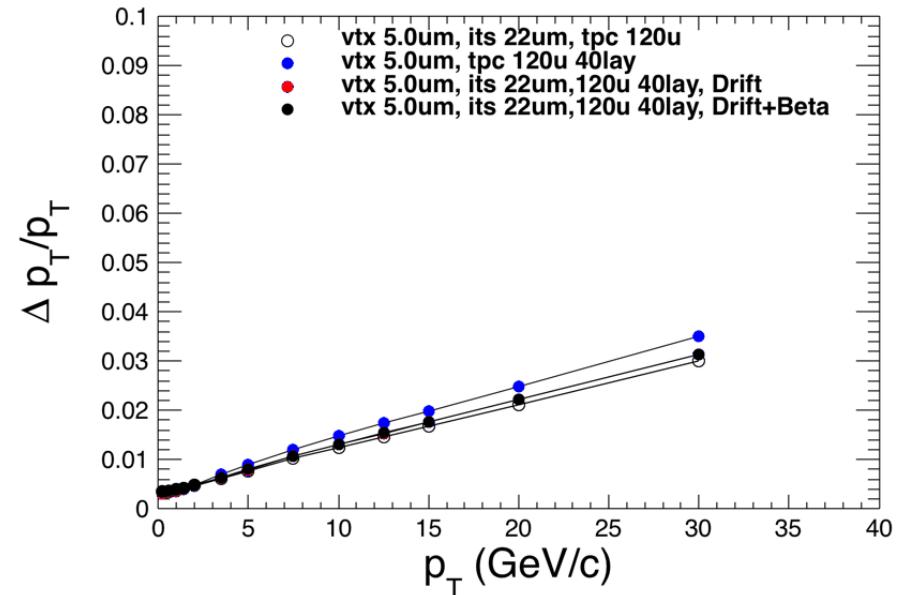
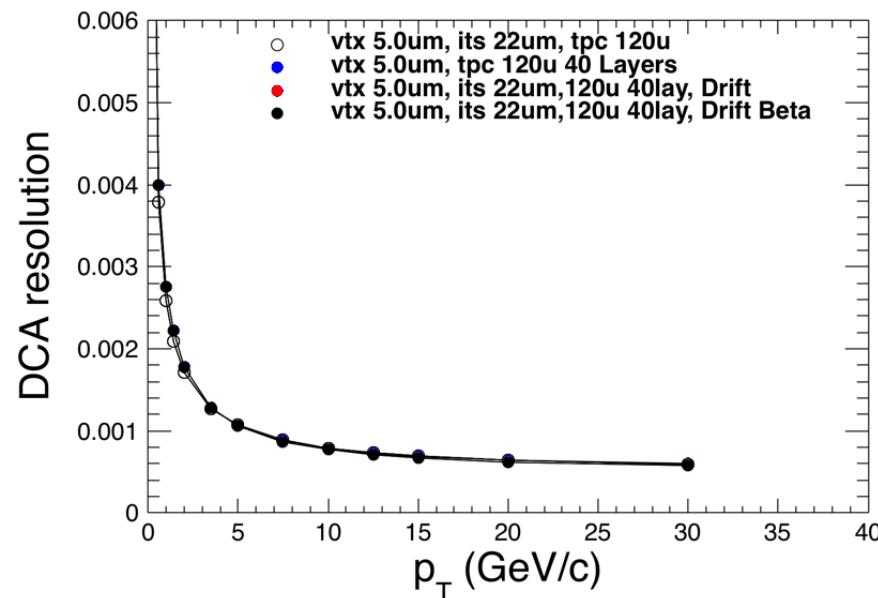
Implemented Drift dependence of TPC resolution

```
40 Time Projection Chamber (TPC)
41 sigma^2=sigma0^2+sigma1^2*sin(beta)^2+Cdiff^2*6mm/h*sin(theta)*Ldrift[m]
42 Number of layers      : 40 (was 60)
43 Radii [mm]           : 300,750 (was 780)
44 Upper limit in z [mm]: 1055.0
45 Lower limit in z [mm]: -1055.0
46 Efficiency RPhi       : 1
47 Efficiency z          : 1
48 Thickness [rad. lengths] : 8.2*1e-5
49 sigma0(RPhi) [1e-6m]   : 90
50 sigma1(RPhi) [1e-6m]   : 900 -> sigma1^2*sin(beta)^2  -> beta = angle between track and pad, 900 taken from LIC TPC
51 Cdiff(RPhi) [1e-6m/sqrt(m)] : 60
52 sigma0(z)  [1e-6m]       : 100
53 sigma1(z)  [1e-6m]       : 0
54 Cdiff(z)   [1e-6m/sqrt(m)] : 100
```

Drift parameters from Carlos (thanks!)

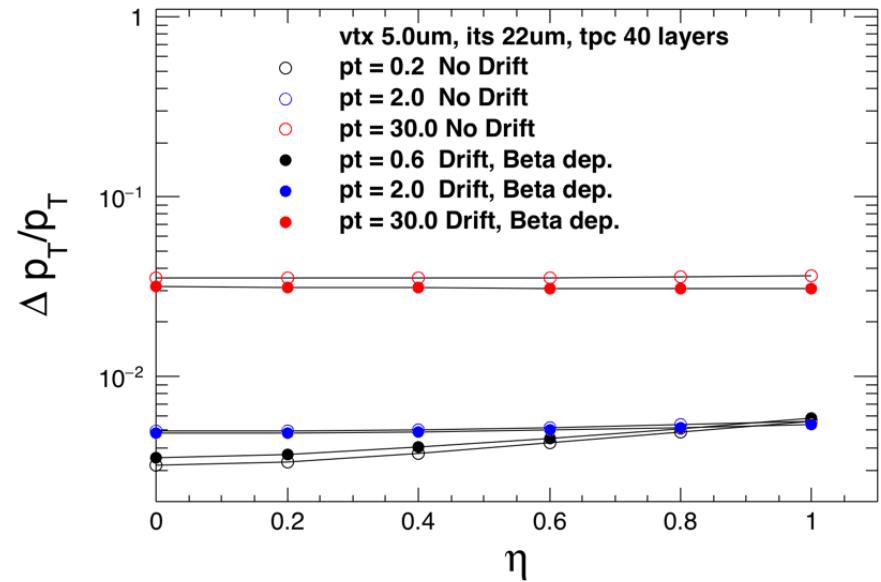
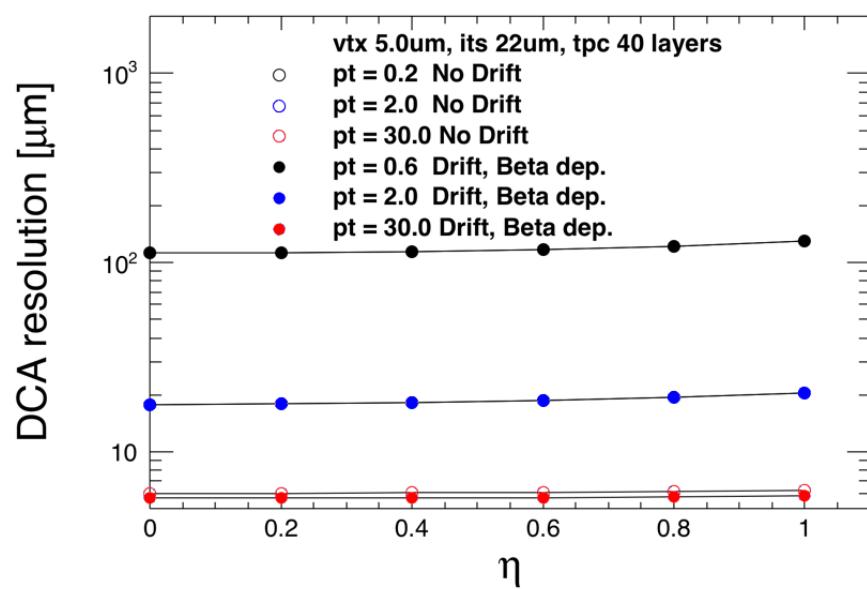


Impact of new TPC resolution parameterization



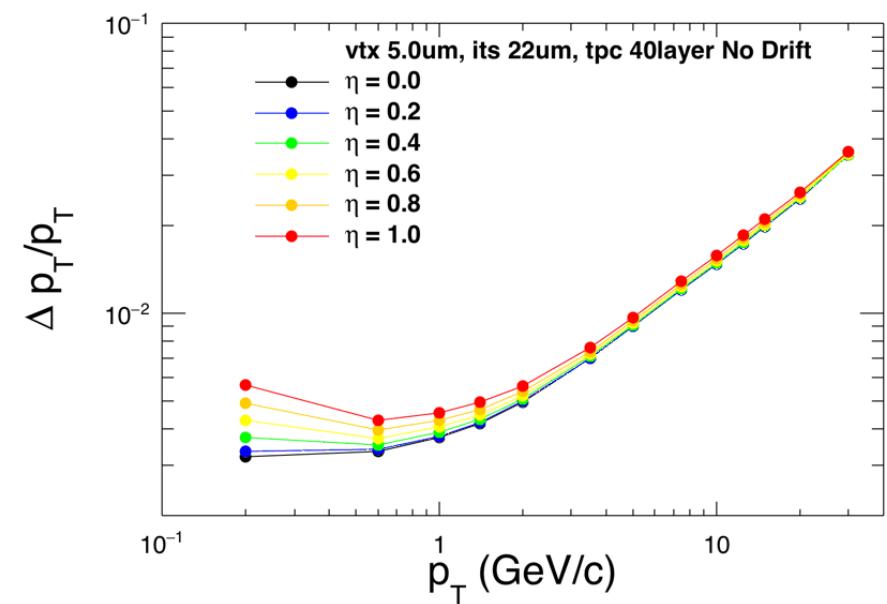
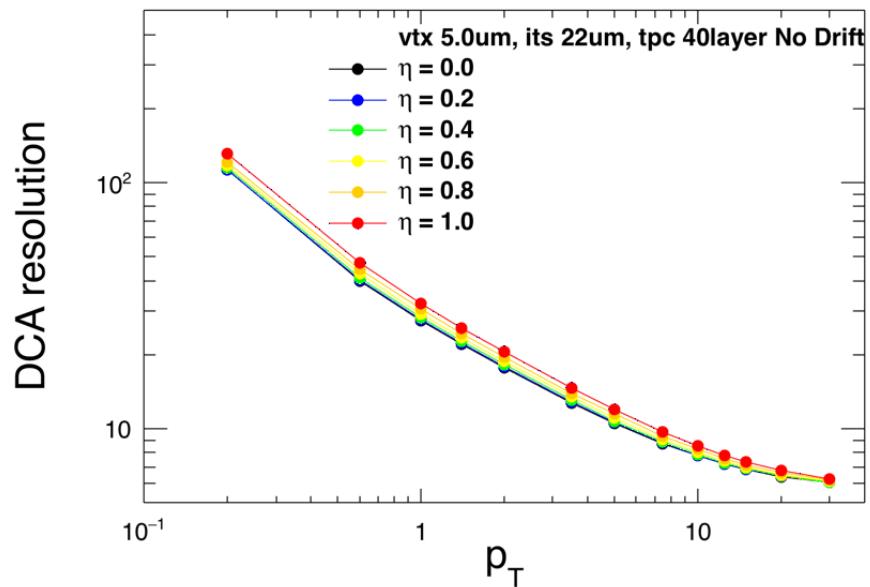
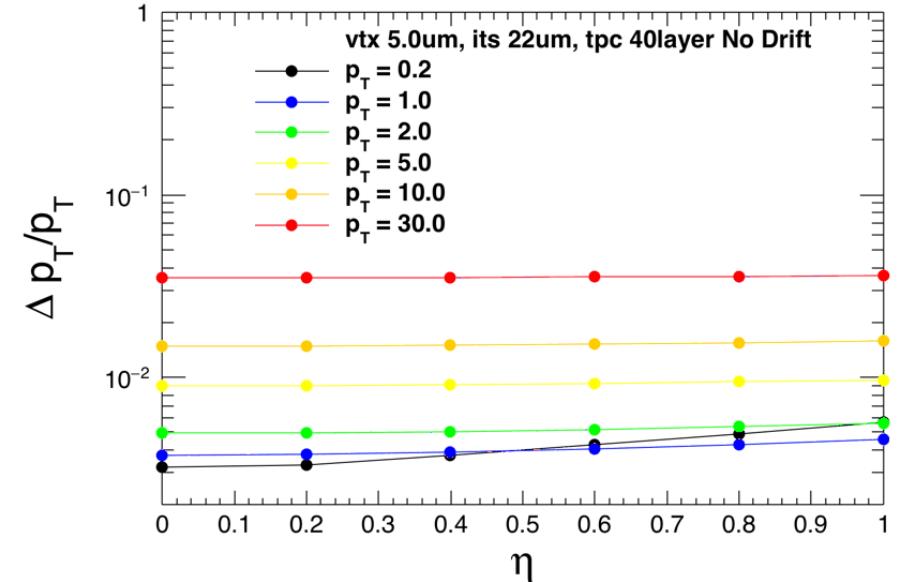
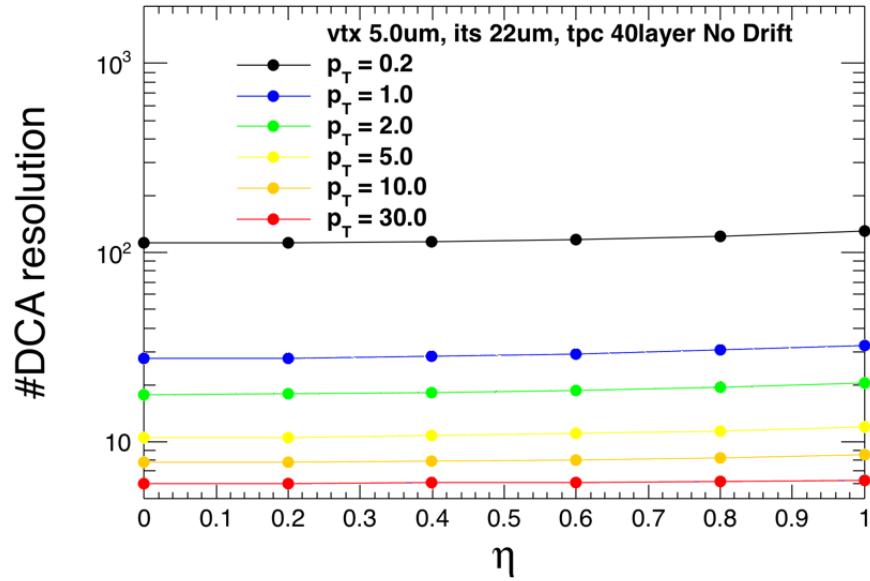
- Change from 60 to 40 layers has a visible impact on the p_T resolution
- Drift parameterization does not have a big effect at mid-rapidity

Drift Dependence

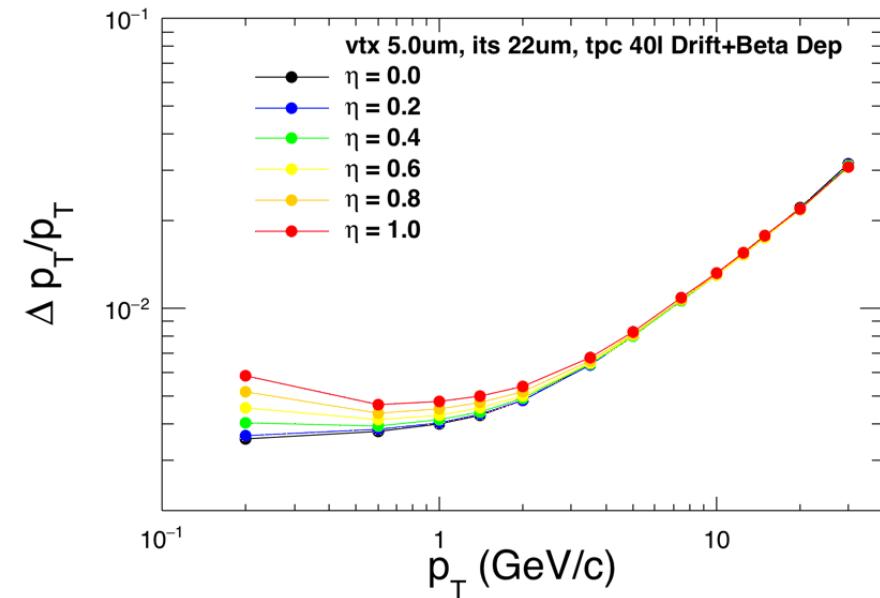
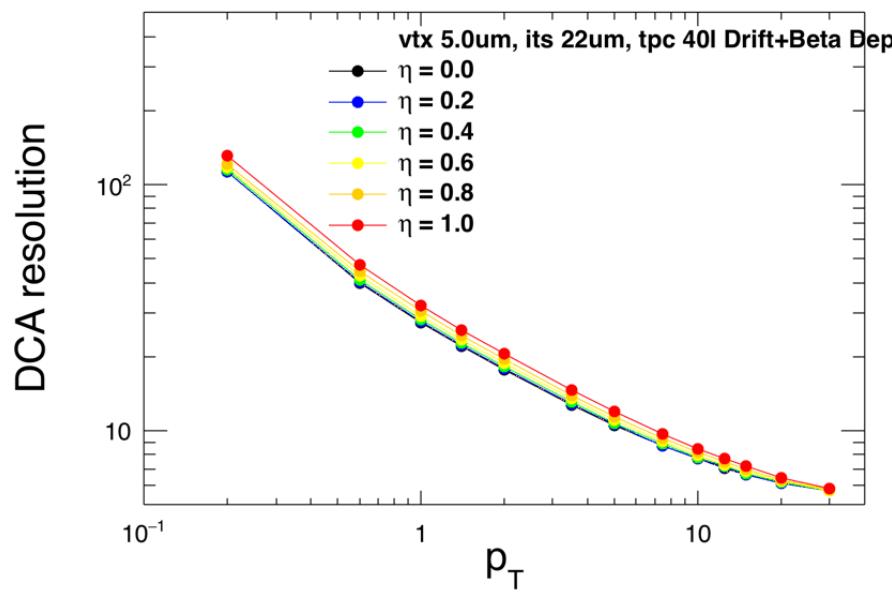
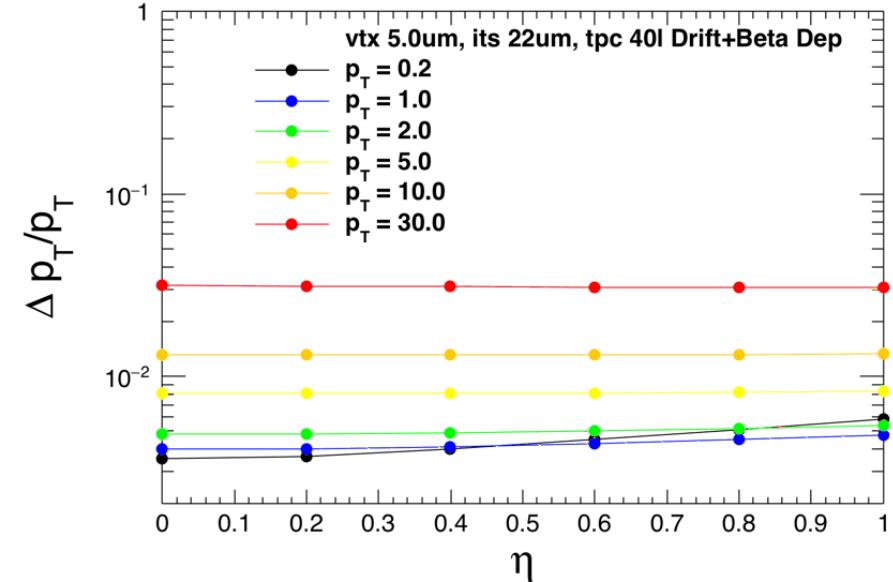
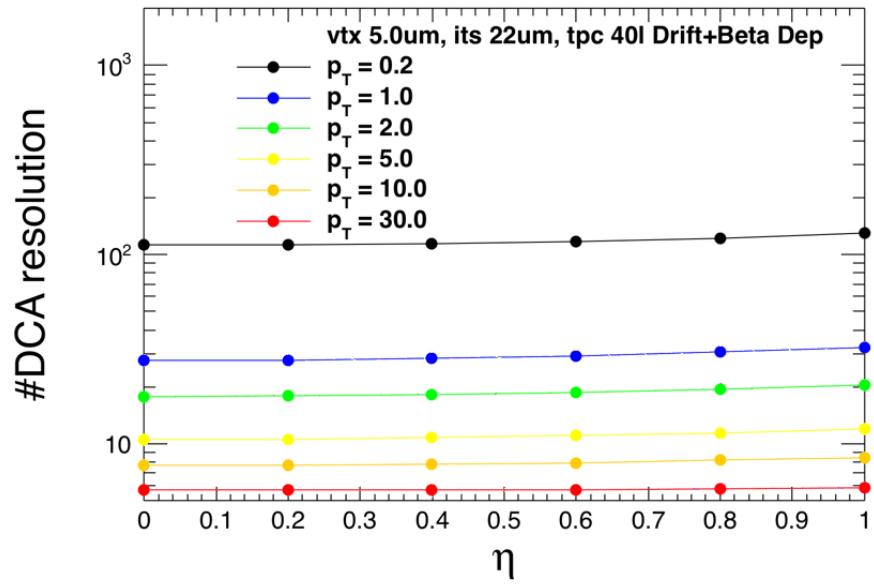


- Visible effect on p_T resolution vs p_T, but nothing dramatic
- Very little change in DCA resolution, as expected

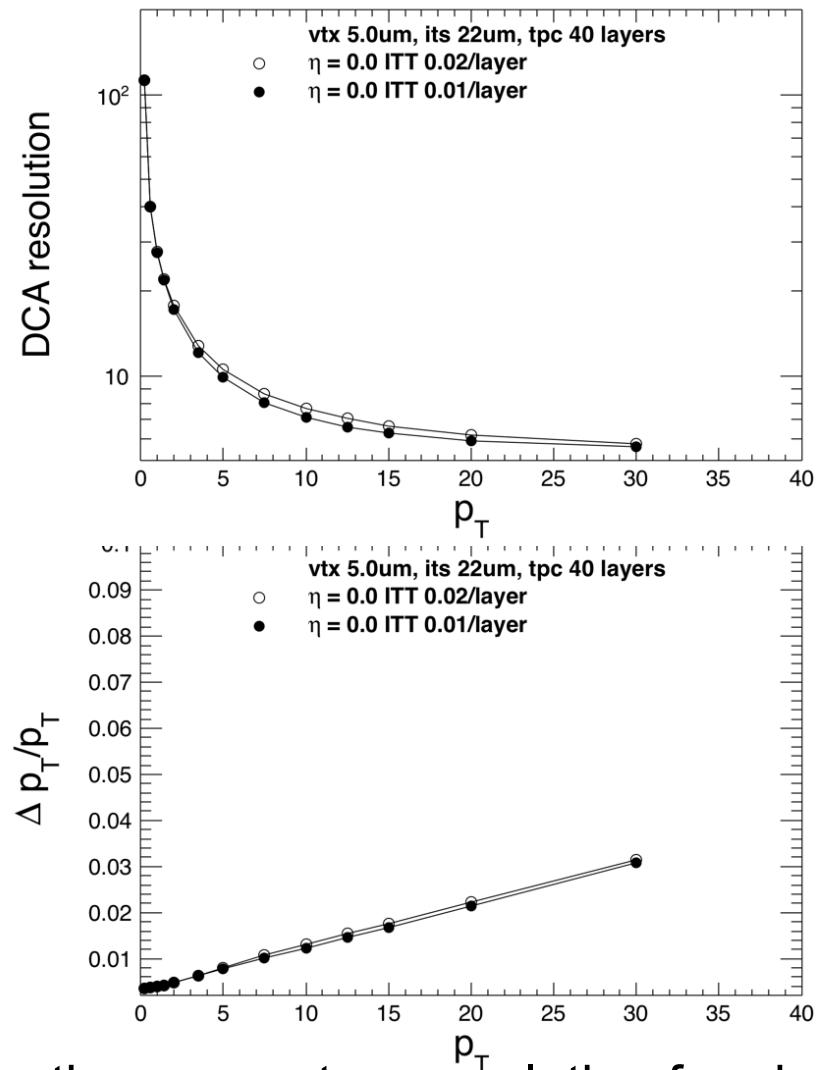
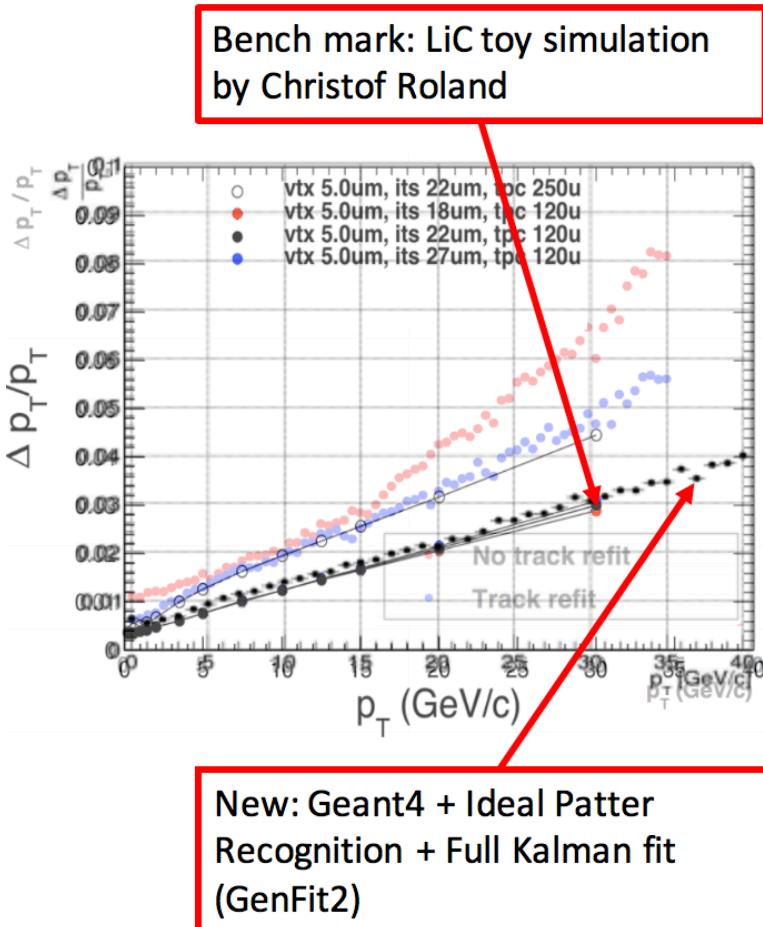
Resolutions without drift dependence



Resolutions, full Drift and Beta dependence



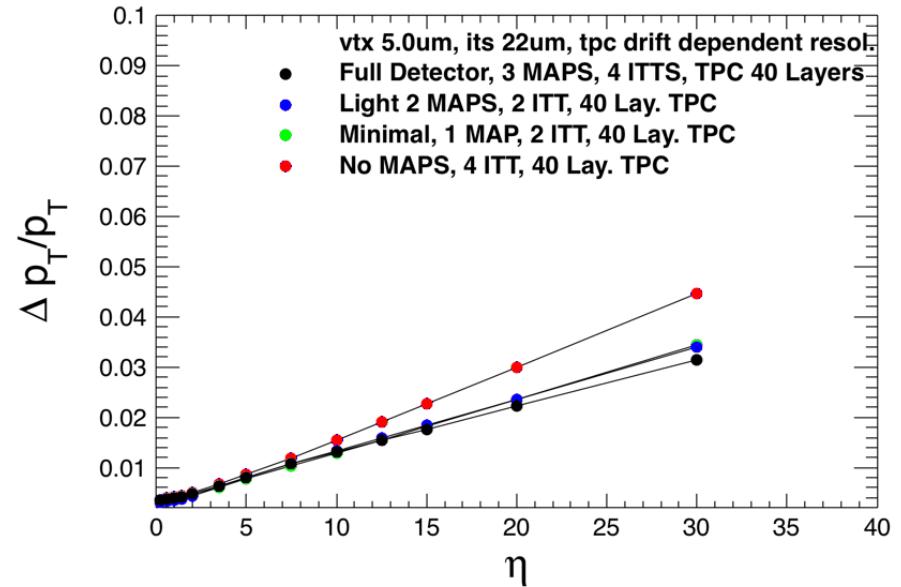
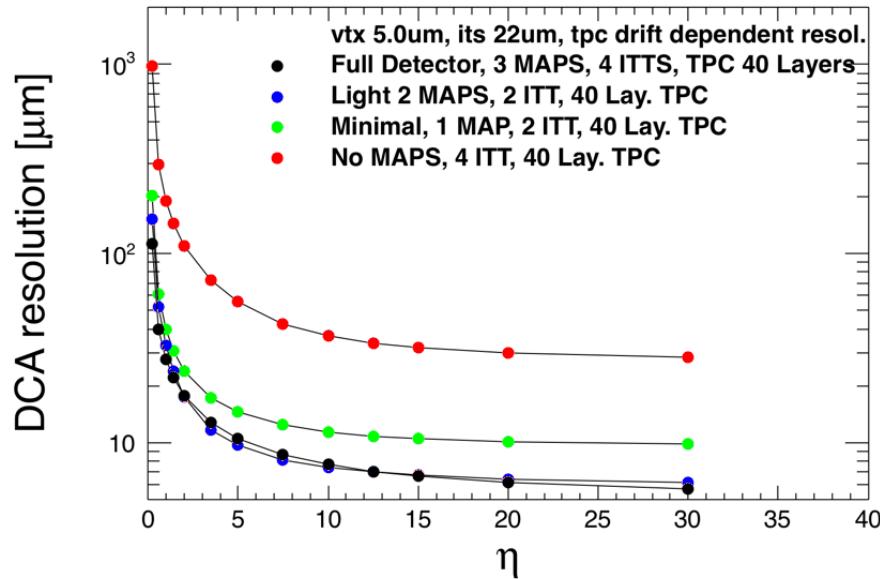
1% vs 2% ITT layers...



- Mass budget of ITT has little impact on the momentum resolution for pions
- Check number of TPC layers?



Alternate Detector Configurations



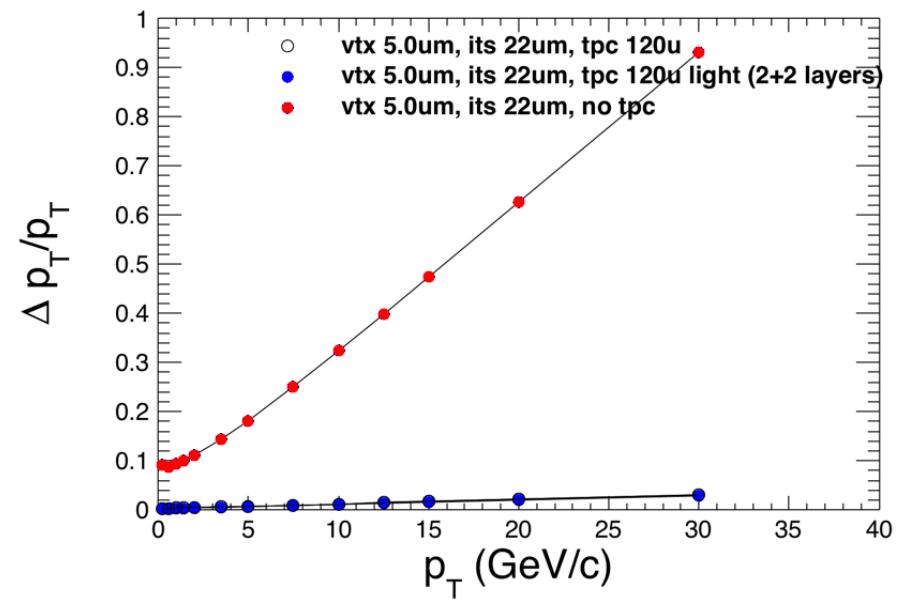
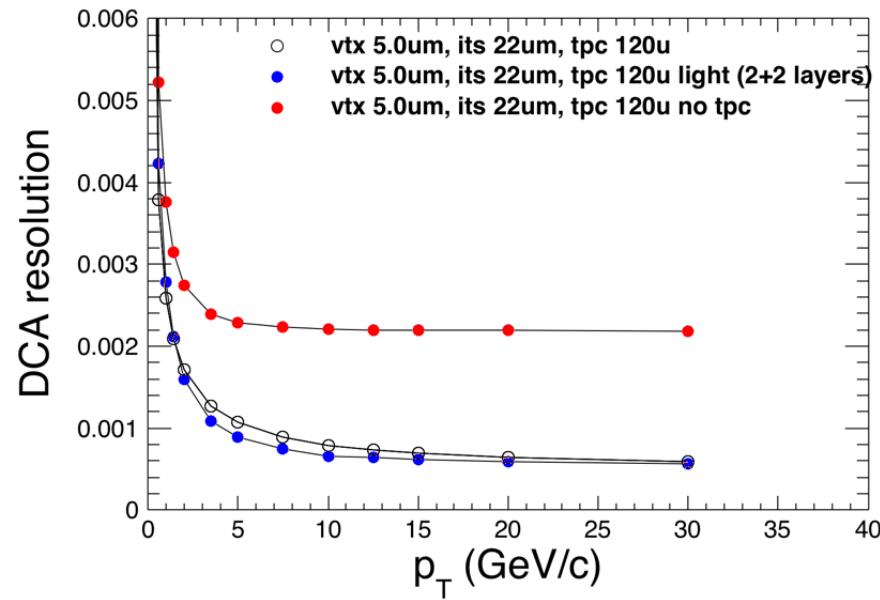
- Alternate detector configurations
 - Default -> 3 MAPS Layers, 4 ITT Layers, 40 Layers TPC
 - Light-> 2 MAPS Layers, 2 ITT Layers to save material budget
 - Slight performance advantage below 10GeV due to lower material budget
 - Minimal -> 1 Maps Layer, 2 ITT Layers, 40 Layers TPC
 - Significant performance decrease (remember 95% hit efficiency per layer)
 - No Maps
 - Likely death sentence for Heavy Flavor program...



BACK-UP



Standalone MAPS+ITT performance



MAPS+TPC performance (no ITT)

